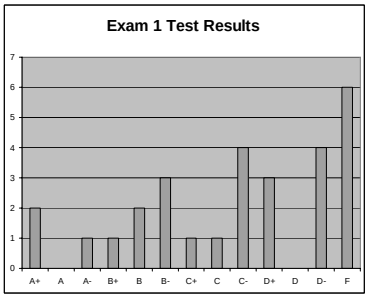
99.0
97.5
90.0
87.0
86.0
85.0
83.0
83.0
80.0
79.0
73.5
73.5
71.5
71.5
71.5
69.0
68.5
68.0
62.5
61.0
59.5
59.5
59.5
57.0
56.5
56.0
48.0
46.0

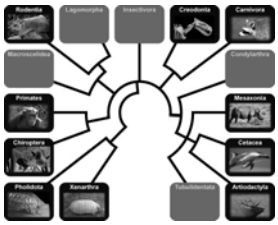
EXAM I

Average: 71.5



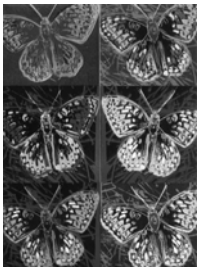
Anthropology 215

SYSTEMATICS, TAXONOMY & CLASSIFICATION



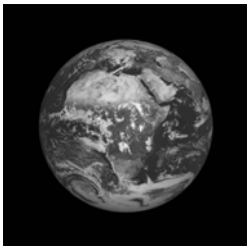
Biodiversity

- about 2 million named species
- 3/4 are insects
- 10-100 million (13-14 million) living species:
- insects and microscopic life in tropics
- '99% of species are extinct'
- '99% of known animal species smaller than bumble bees' (Steven J. Gould)

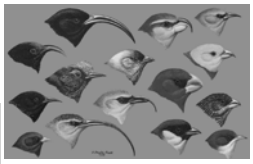


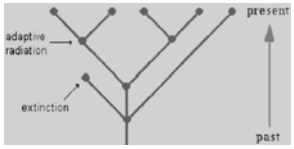
Diversity of life and Evolution

- Causes for patterns of similarities and differences between organisms?
- Biological classifications reflect evolutionary history and biological relationships



Adaptive Radiation

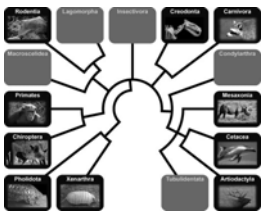




Definition: the relatively rapid expansion and diversification of an evolving group of organisms as they adapt to new ecological niches.

Systematics

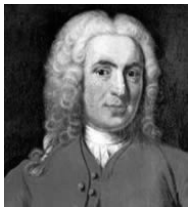
- Taxonomy
- Classification
- Nomenclature



Classification

- **hierarchical classification: classification by subordination**

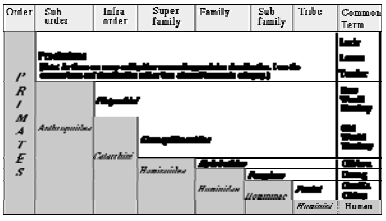
Linnaeus (1758)
Systema Naturae



Kingdom
Phylum
Class
Order
Family
Genus
Species

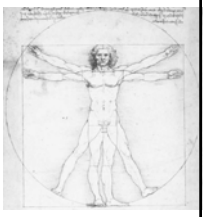
Taxon (plural: taxa)

- **group of real organisms recognized as a formal unit at any level of the hierarchal classification**



Taxa Names

Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Primates
Family: Hominidae
Genus: Homo
Species:
Homo sapiens



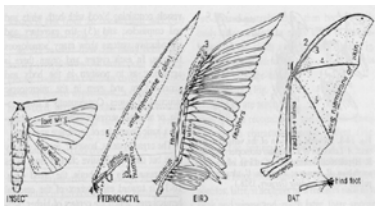
Classification: an inductive process

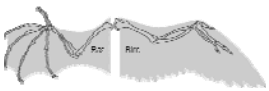
Identification: a deductive procedure (used to locate one or more individuals in an established classification)

Deduction: is reasoning from universal to individual (or from general to particular).

Typology

Analogies

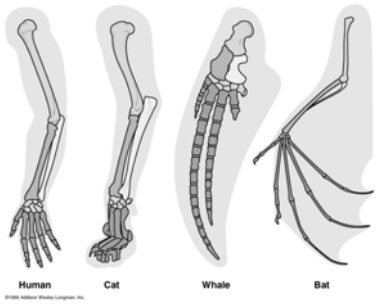




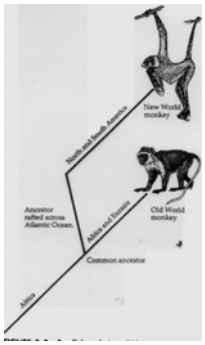
Wings of butterfly, bird and bat are analogous structures.

They serve the same function, flying

Homologous Structures



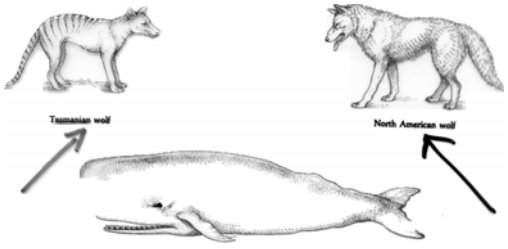
Homoplasies



Parallel evolution

Old World and New World monkeys

Convergent Evolution

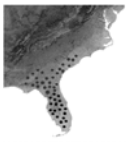


Tasmania wolf and North American wolf. North American wolf is more closely related to the whale.

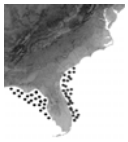
biological definition of the species:

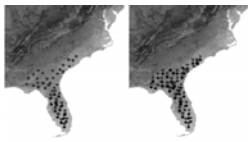
"species comprise a homogenous community whose members closely resemble one another in general morphological (anatomical) structure and are capable of interbreeding freely and producing fully fertile offspring".

Species



Parapatric – Species are found in connected but not overlapping areas





Sympatric (non-geographic) – species are found in completely or partially overlapping areas

Allopatric (geographic) – species occupy geographically separated areas

Time-successive, evolutionary, paleospecies, morphospecies

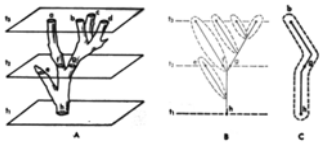


FIGURE 12. DIAGRAMS OF A PHYLOGENY AND OF GENETICAL SPECIES AND LINEAGES WITHIN IT

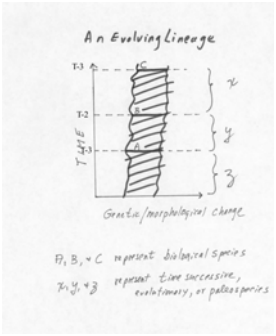
A. Three-dimensional representation of a phylogeny. The horizontal dimensions within each branch symbolize extent of variation, and horizontal distances between branches represent degree of divergence between isolated lineages and species. The tree is represented as cut by time plans at time t1, t2, and t3, and the intersects of each are genetical contemporaneous species.

B. Formal representation of the same phylogeny in two dimensions, with the same time intersects and genetical species (heavy dots). Each line leading to a terminal genetical species is a clearly separate lineage, enclosed in broken lines. The problems classifying common stems and of possible successional divisions of longer lineages (*e.g., f-a*) require further consideration.

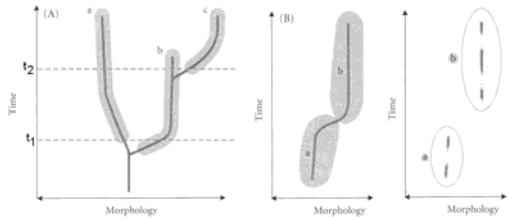
C. Lineage pattern starting from a terminal species, *b* as an example, and tracing back to the initial species, *h*, of the phylogeny. Each terminal species has such an extended lineage, all overlap eventually as they are followed backward in time.

Evolutionary/Biological Species

- **A, B & C = biological species**
- **x, y, & z = time successive, evolutionary, or paleospecies**



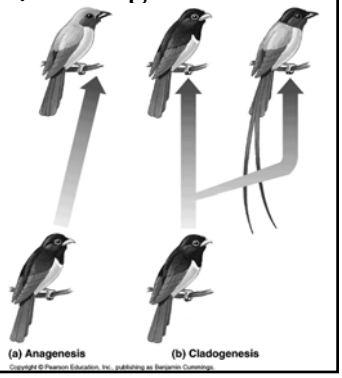
Evolutionary species and chronospecies



- (**A**) **Evolutionary species**.
- (**B**) **Chronospecies**. (after Futuyma 1997)

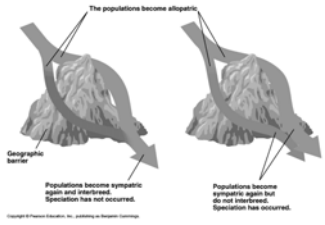
Anagenesis/Cladogenesis

- **Anagenesis: straight line or sequential evolution**
- **Cladogenesis: branching evolution**



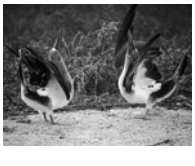
Speciation

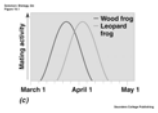
- Geographic or allopatric speciation (allopatric species)
- Non-geographic or sympatric speciation (sympatric species)



Causes

Reproductive isolation
Behavioral (ethological) changes
Temporal/seasonal isolation
Mechanical isolation





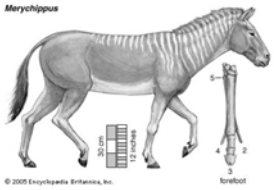
Higher Categories and Nomenclature

- Higher Categories
- e.g., Genus
- Nomenclature
- International Code of Zoological Nomenclature (1901)
- Species names
- binomial name
- *Homo sapiens* (Linneaus, 1758)
- *Homo sapiens*

Nomenclature

- Rule of Priority (1758)
- type specimen
- taxonomic type
- endings:
- -iformes (Infraorder)
- -oidea (Superfamily)
- -idae (Family)
- -inae (Subfamily)
- -inin (Tribe)

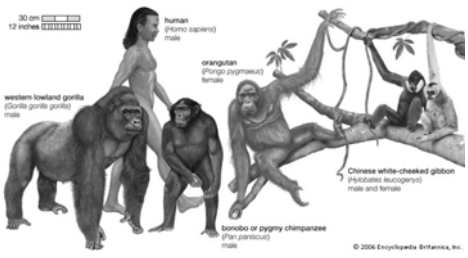
Derived & Shared Traits



horse's toe is derived

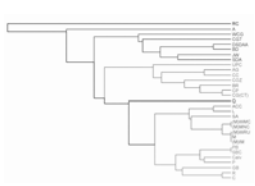
human's 5 digits is primitive

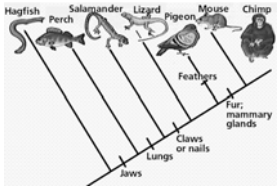
Tailless Apes

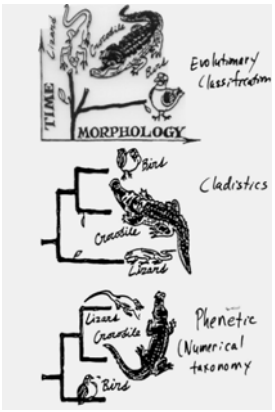


Classification

- **Phenetics (Numerical Taxonomy)-overall similarity**
- **Cladistics (shared derived features)**







How should crocodiles, lizards, and birds be classified?

All the evidence suggests that birds and crocodiles are literally more closely related than crocodiles and lizards: that is, they shared a more recent common ancestor, as indicated in the top figure.

Cladists, who classify animals strictly according to their evolutionary (phylogenetic) relationship, would therefore put birds with crocodiles.

But numerical taxonomists are more interested in observable – phenetic – similarities: and would classify lizards and crocodiles together (in the class 'Reptilia') leaving birds on their own (as 'Aves').